PATENT ABSTRACTS OF JAPAN

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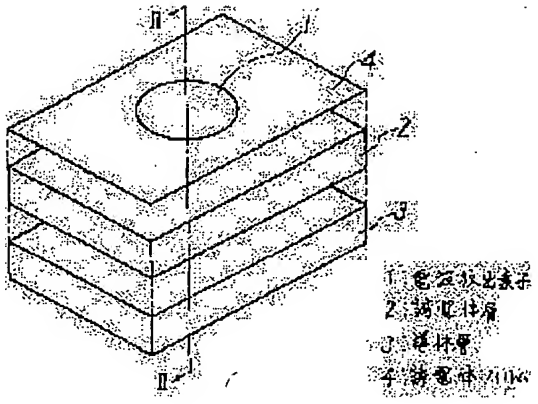
(54) ANTENNA UNIT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an antenna unit in which the beam width can be regulated easily in the radiation pattern of an antenna and the degree of freedom is increased in the reduction of size and thickness antenna unit.
SOLUTION: The antenna unit has such a structure as a dielectric layer 2 and a radio wave radiating element 1 are sequentially laid in layers on a conductor layer 3 wherein the dielectric layer 2 comprises a dielectric having uneven dielectric constant and/or thickness in the thickness direction of the layer. In a preferred embodiment, the radio wave radiating element 1 is formed on a dielectric film 4 and placed on the dielectric layer 2. Other radio wave radiating element 1, dielectric layers 21-24, and the like, are laid in layers on the radio wave radiating element 1.



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CLAIMS

[Claim(s)]
[Claim 1] Antenna equipment characterized by having the radio emission component by which specific inductive capacity and/or thickness have been arranged at least on an uneven dielectric layer and the above-mentioned dielectric layer in the direction of thickness while having been arranged on a conductor layer and the above-mentioned conductor layer.
[Claim 2] Antenna equipment according to claim 1 characterized by making a dielectric film intervene between a radio emission component and a dielectric layer.
[Claim 3] A dielectric layer is antenna equipment according to claim 1 or 2 characterized by the specific inductive capacity in directly under [of a radio emission component] and its near of the above-mentioned dielectric layer being uniform at least, and thickness being uneven.
[Claim 4] A dielectric layer is antenna equipment according to claim 1 or 2 characterized by the specific inductive capacity in directly under [of a radio emission component] and its near of the above-mentioned dielectric layer being uneven at least, and thickness being uniform.
[Claim 5] Antenna equipment of claim 1 characterized by having arranged another dielectric layer on a radio emission component - claim 4 given in any 1 term.
[Claim 6] Antenna equipment according to claim 5 characterized by having arranged one or more another radio emission components on another dielectric layer.
[Claim 7] Another dielectric layer is antenna equipment according to claim 6 with which specific inductive capacity and/or thickness are characterized by the uneven thing in the direction of thickness at least.
[Claim 8] Antenna equipment according to claim 5 characterized by making another dielectric film intervene between dielectric layers different from another radio emission component.

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DETAILED DESCRIPTION

[Detailed Description of the Invention] [0001]
[Field of the Invention] This invention relates to the antenna equipment suitable for being used for the communication link fields, such as satellite communication and microwave communication, and constituting an array antenna. [0002]
[Description of the Prior Art] Conventionally, as structure of this kind of antenna equipment, there are some which were carried on 109th page - 110th page of an antenna engineering handbook, for example, and drawing 12 is that outline structural drawing. As for a radio emission component and 2, in drawing 12 , 1 is [a dielectric layer and 3] conductor layers. The conventional dielectric layer 2 is constituted by the dielectric plate which consists of a single dielectric, and the radio emission component 1 and a conductor layer 3 are formed by each giving a thin conductor to such a dielectric plate. Moreover, the laminating of a dielectric layer and the dielectric film is carried out to order on a conductor layer, and the technique which forms a radio emission component on this dielectric film is indicated by JP,9-107226,A.
[0003] In drawing 12 , if electric power is supplied to the radio emission component 1, between the edge of the radio emission component 1, and a conductor layer 3, electric field, i.e., the magnetic current, will occur and a resonator will be formed. In order that this source of the magnetic current may operate as a slot antenna, an electric wave is emitted in the perpendicular direction (the direction of the thickness of a dielectric layer 2) to this antenna equipment. In addition, the magnitude of the radio emission component 1 is decided with the specific inductive capacity and thickness of an operating frequency and a dielectric layer 2.
[0004] By the way, with conventional antenna equipment, since only the dielectric of limited **** part had been used for the configuration of a dielectric layer 2, adjustment of the beam width of the radiation pattern of antenna equipment is difficult, and a miniaturization and thin-shape-izing of antenna equipment also had the problem that it was restricted to some extent.
[0005] [Problem(s) to be Solved by the Invention] In view of the above-mentioned actual condition in the conventional technique, adjustment of the beam width in the radiation pattern of an antenna is easy for this invention, and it makes it a technical problem to offer the antenna equipment whose degree of freedom of the miniaturization of antenna equipment or thin-shape-izing improved.
[0006] [Means for Solving the Problem] The antenna equipment of this invention is equipped with the radio emission component by which specific inductive capacity and/or thickness have been arranged at least on an uneven dielectric layer and the above-mentioned dielectric layer in the direction of thickness while it is arranged on (1) conductor layer and the above-mentioned conductor layer.
(2) Make a dielectric film intervene between a radio emission component and a dielectric layer in the above (1).

(3) In the above (1) or (2), the specific inductive capacity of a dielectric layer in directly under [of a radio emission component] and its near of the above-mentioned dielectric layer is uniform at least, and its thickness is uneven.
(4) In the above (1) or (2), the specific inductive capacity of a dielectric layer in directly under [of a radio emission component] and its near of the above-mentioned dielectric layer is uneven at least, and its thickness is uniform.
(5) The above (1) In any 1 term of - (4), another dielectric layer is arranged on a radio emission component.
(6) In the above (5), one or more another radio emission components are arranged on another dielectric layer.
(7) In the above (6), specific inductive capacity and/or thickness of another dielectric layer are uneven in the direction of thickness at least.
(8) Make another dielectric film intervene between dielectric layers different from another radio emission component in the above (5).
[0007]
[Embodiment of the Invention] In the gestalt of many following operations, with the gestalt of implementation of the consecutiveness about the same part as the part shown in the gestalt of the operation to precede, a same sign may be attached and explanation of each contents may be omitted as referring to explanation with the gestalt of the operation to precede.
[0008] Gestalt 1. drawing 1 of operation - drawing 2 explain the gestalt 1 of operation of the antenna equipment in this invention, drawing 1 is the decomposition perspective view of the gestalt 1 of operation, and drawing 2 is the sectional view which met the II-II line in the condition of drawing 1 of not decomposing. For 1, as for a dielectric layer and 3, in drawing 1 - drawing 2 , a radio emission component and 2 are [a conductor layer and 4] dielectric films.
[0009] A dielectric layer 2 differs from the conventional antenna equipment which specific inductive capacity's is uneven and is shown in drawing 12 in this point fundamentally in the direction of that thickness. Noting that there is especially no limit about the heterogeneity of the specific inductive capacity in a dielectric layer 2, for example, a dielectric layer 2 is the multilayer structure of n layers now in this invention It applies to the radio emission component 1 side from a conductor-layer 3 side, and they are the 1st layer and layer [2nd] .... the i-th layer. Supposing it consists of layer [i+1st] .... the n-th layer A gestalt with the larger specific inductive capacity of the i+1st layer than that of the i-th layer, the gestalt A in which it will apply to the radio emission component 1 side from a conductor-layer 3 side, and specific inductive capacity will increase gradually if it puts in another way The specific inductive capacity of the i+1st layer is the gestalt C from which specific inductive capacity while being a gestalt smaller than that of the i-th layer, the gestalt B in which it applies to the radio emission component 1 side from a conductor-layer 3 side, and specific inductive capacity decreases gradually, and layer [1st] - the n-th layer completely changes at random, when it puts in another way. in addition, the magnitude of the above n which the overall thickness of a dielectric layer 2 is usually about lambda/[lambda/5 -] 500 (lambda: wavelength) extent, for example, 0.1-1mm, and can be set in that case -- at least 2 -- it is five to about 100 preferably, and it is desirable at least 0.01 and to set especially the difference of the specific inductive capacity of the i-th layer and the i+1st layer to at least

0.05.
[0010] About the average specific inductive capacity of a dielectric layer 2, although there is especially no limit, unless one to about ten are suitable for it and conductivity and its dielectric loss are excessive also about the component, there is especially no limit. When this component is illustrated, polyethylene, polypropylene, polybutene, Olefin system resin, such as the Polly 4 methyl pentene -1, polystyrene, Styrene resin, such as poly methyl styrene and polyacrylonitrile styrene, Fluororesin, such as polytetrafluoroethylene and polychlorotrifluoroethylene resin, A polyvinyl chloride, a polyvinylidene chloride, thermoplastic polyester, a thermoplastic polyamide, An ethylene-vinylacetate copolymer, an ethylene-ethyl acrylate copolymer, A polycarbonate, polyacetal, poly para-phenylene, poly para-phenylene oxide, The thermoplastics of others, such as polysulfone, phenol resin, an epoxy resin, They are ceramics, such as thermosetting resin, such as thermosetting polyester, a thermosetting polyamide, polyamidoimide, polyimide, and diallyl phthalate resin, alumimium nitride, silicon nitride, and boron nitride.
[0011] Change of the specific inductive capacity between layer [1st] - the n-th layer may prepare two or more sheets with which that from which specific inductive capacity differs may be chosen from the above mentioned component or other ingredients, and the laminating of the sheet of two or more selected ingredients to write may be carried out by welding or non-welding, or whenever [foaming] differ about a certain specific ingredient, and may carry out the laminating of them by welding or non-welding. For example, by making polyethylene foam [whenever / foaming] to about 0 (foaming [no]) - 80% whenever [foaming] using a gas foaming agent like about 0 (foaming [no]) - 40%, or argon gas using a chemistry foaming agent like an AZOJI carvone amide, the thing of the range of 2.3 (foaming [no]) is obtained from low specific inductive capacity with the specific inductive capacity near 1, it is the thing of this specific-inductive-capacity range, and layer [1st] - the n-th layer may be formed.
[0012] A conductor layer 3 can be formed by plating copper and a conductive metal like aluminum on one side of a dielectric layer 2, or attachment by the adhesives of the foil of this conductive metal. Moreover, the radio emission component 1 may also be directly formed in other one side of a dielectric layer 2, without using the dielectric film 4. However, pattern formation of the radio emission component 1 is usually carried out from the deposit of copper and a conductive metal like aluminum by etching techniques, such as photo etching and a photolithography. In that case, by what has difficult application of an etching technique, it becomes difficult like a difficult thing or ceramics to form [of the radio emission component 1] plating of a conductive metal like the thing and olefin system resin with which one side besides the above of a dielectric layer 2 has irregularity in a front face like a foaming organic macromolecule. On the other hand, when the dielectric film 4 is adopted, there is also an advantage to which formation of the radio emission component 1 becomes easy as this dielectric film 4 at the formation list of the deposit of the above-mentioned conductive metal by carrying out selection use of the good ingredient of the applicability of the etching technique about this deposit, for example, thermoplastic polyester, a thermoplastic polyamide, the polycarbonate, etc., and the degree of freedom of selection of the component of a dielectric layer 2 becomes large. as a dielectric film 4, an about 50-micrometer thing is suitable from handling, and it is combined by the dielectric layer 2, welding, or adhesion -- having -- **** -- or

dielectric layer 2 is said gestalt B conversely and it is made for specific inductive capacity to decrease gradually, applying the specific inductive capacity of a dielectric layer 21 to an outside-surface side from the radio emission component 1 side like Gestalt B, there is effectiveness which makes beam width large further.

[0017] Gestalt 4. drawing 5 of operation is the sectional view of the gestalt 4 of operation of the antenna equipment in this invention. As for a radio emission component and 2, in drawing 5 , 1 is [a dielectric layer and 3] a conductor layer and dielectric layer with 4 [another / a dielectric film and 22]. The gestalten 4 of operation differ in the point that the laminating of the dielectric layer 22 was carried out on the radio emission component 1, and are [other structures] the same. [of the gestalt 1 of said operation]

[0018] As for the thickness, right above [of the radio emission component 1] is thin meat, and the dielectric layer 22 of the other part is heavy-gage, although a single carries out a deer and specific inductive capacity consists of one sort of a fixed dielectric which was described above. A dielectric layer 22 can make beam width large further by being as the thickness being the above, when the specific inductive capacity of a dielectric layer 2 other than the effectiveness of acting as a protective layer of the radio emission component 1 like the dielectric layer 21 in the gestalt 3 of operation is said gestalt B. On the other hand, when the specific inductive capacity of a dielectric layer 2 is said gestalt A, right above [of the radio emission component 1 of a dielectric layer 22] presupposes that it is heavy-gage, and the other part has the effectiveness which can make beam width still narrower by considering as thin meat.

[0019] It is VII-VII [in / gestalt 5. drawing 6 of operation - drawing 7 explain the gestalt 5 of operation of the antenna equipment in this invention, and drawing 6 is the decomposition perspective view of the gestalt 5 of operation, and / in drawing 7 / the condition of drawing 6 of not decomposing]. It is the sectional view which met the line. In drawing 6 - drawing 7 , 1 is a radio emission component and dielectric film with 2 [another / a dielectric layer, dielectric layer with 3 / another / a conductor layer, radio emission component with 4 / another / a dielectric film and 11 /, and 23 / again /, and 41].

[0020] Unlike the gestalt 1 of operation, in the point which carried out the laminating of a dielectric layer 23, the dielectric film 41, and the radio emission component 11 one by one on the radio emission component 1, the other structures of the gestalt 5 of operation are the same. In the above-mentioned structure, there is effectiveness which can carry out [broadband]-izing of the impedance characteristic of antenna equipment by supplying electric power to the radio emission component 1 by using the radio emission component 11 as a passive element.

[0021] In the gestalt 5 of operation, a deer is carried out, it is formed by the etching technique about the conductive metal layer plated on the dielectric film 41, the radio emission component 11 of the function of the dielectric film 41 is the same as that of the function of the dielectric film 4 to said radio emission component 1, and when formation of a up to [the dielectric layer 23 of the radio emission component 11] is easy, it can also omit the dielectric film 41.

[0022] A dielectric layer 23 may be uneven identically to a dielectric layer 2 uniformly [specific inductive capacity / in / it may be constituted by different dielectric and / the direction of the thickness] like a dielectric layer 2. Furthermore, if it is made for specific inductive capacity to increase gradually, applying the specific inductive capacity of a

dielectric layer 23 to the radio emission component 11 side from the radio emission component 1 side like Gestalt A when the specific inductive capacity of a dielectric layer 2 is said gestalt A, a dielectric layer 23 Beam width is made still narrower, and when the specific inductive capacity of a dielectric layer 2 is said gestalt B conversely and it is made for specific inductive capacity to decrease gradually, applying the specific inductive capacity of a dielectric layer 23 to the radio emission component 11 side from the radio emission component 1 side like Gestalt B, there is effectiveness which makes beam width large further.

[0023] Gestalt 6. drawing 8 of operation - drawing 9 explain the gestalt 6 of operation of the antenna equipment in this invention, drawing 8 is the decomposition perspective view of the gestalt 6 of operation, and drawing 9 is the sectional view which met the IX-IX line in the condition of drawing 8 of not decomposing. In drawing 8 - drawing 9 , 24 is still more nearly another dielectric layer, and the gestalten 6 of operation differ in the point that the laminating of the dielectric layer 24 was carried out on the radio emission component 11, and are [other structures] the same. [of the gestalt 5 of said operation]

[0024] A dielectric layer 24 may be uneven identically to a dielectric layer 2 uniformly [specific inductive capacity / in / it may be constituted by different dielectric and / the direction of the thickness] like a dielectric layer 2. Since the radio emission component 11 and the dielectric film 41 will be inserted into a dielectric layer 24 and a dielectric layer 23 and the location gap to the radio emission component 1 of bending of the dielectric film 41 and the radio emission component 11 is prevented by preparing it regardless of the class of dielectric which constitutes a dielectric layer 24, manufacture of antenna equipment becomes easy. A dielectric layer 24 is furthermore effective in acting also as a protective layer of the radio emission component 1. Furthermore, a dielectric layer 24 is effective in making beam width still more widely or narrow in harmony with change of the specific inductive capacity of a dielectric layer 2 or a dielectric layer 23, and enabling still minuter accommodation of beam width, and raising the degree of freedom of the miniaturization of antenna equipment, or thin-shape-izing by changing the specific inductive capacity in the thickness direction gradually.

[0025] Gestalt 7. drawing 10 of operation - drawing 11 explain the gestalt 7 of operation of the antenna equipment in this invention, drawing 10 is the decomposition perspective view of the gestalt 7 of operation, and drawing 11 is the sectional view which met the XI-XI line in the condition of drawing 10 of not decomposing. Unlike the gestalt 6 of operation, in the point of having omitted the dielectric film 41 prepared in the gestalt 6 of operation, the other structures of the gestalt 7 of operation are the same. On the occasion of manufacture of the gestalt 7 of operation, the radio emission component 11 is formed in one side of a dielectric layer 24 of a photolithography etc., subsequently, a dielectric layer 24 makes the side in which the radio emission component 11 was formed counter a dielectric layer 23, and a laminating is carried out.

[0026] The gestalt 7 of operation is effective in the dielectric film 41 which was advantageous when it consisted of dielectrics with which a dielectric layer 24 can form the radio emission component 11 in the one side by a photolithography etc., and was prepared in the gestalt 6 of operation being omissible.

[0027] This invention is not limited to the above mentioned gestalt of operation, and includes various deformation gestalten. For example, as for each dielectric layer 24 of each dielectric layer 23 of each dielectric layer 2 of the gestalten 1-7 of operation, the

dielectric layer 21 of the gestalt 3 of operation, the dielectric layer 22 of the gestalt 4 of operation, the gestalt 5 of operation, and the gestalt 6 of operation, the gestalt 6 of operation, and the gestalt 7 of operation, both specific inductive capacity and thickness may be made an ununiformity by each by the approach of arbitration. Moreover, with the gestalt 7 of the gestalt 5 of operation - operation, the laminating of specific inductive capacity and/or the thickness may be carried out through an uneven dielectric layer uniformly [both specific inductive capacity and thickness] in further one or more radio emission components on the radio emission component 11.

[0028]

[Effect of the Invention] Specific inductive capacity and/or thickness set the antenna equipment of this invention in the direction of thickness at least while it is arranged on (1) conductor layer and the above-mentioned conductor layer, as explained above. An uneven dielectric layer, It has the radio emission component arranged on the above-mentioned dielectric layer, and sets to (3) above (1) or the after-mentioned (2). And a dielectric layer The specific inductive capacity in directly under [of a radio emission component] and its near of the above-mentioned dielectric layer is uniform at least, and thickness is uneven, and it sets to (4) above (1) or the after-mentioned (2). A dielectric layer It becomes easy to adjust [of beam width / in / that it is uneven and thickness is uniform / the radiation pattern of an antenna] the specific inductive capacity in directly under [of a radio emission component] and its near of the above-mentioned dielectric layer at least. For example, if it applies to a radio emission component side from a conductor-layer side and specific inductive capacity is made to increase gradually, beam width can be narrowed, and beam width can be made large if it is made reverse. Moreover, if specific inductive capacity is made to change at random, it can consider as desired beam width. Moreover, it is effective in degrees of freedom, such as a miniaturization of antenna equipment which moreover could not accomplish the dielectric of ********** part at all with the single and used conventional technique, thin-shape-izing, and a configuration, improving by a dielectric layer consisting of various kinds of dielectrics with which specific inductive capacity and/or thickness become uneven in the direction of thickness at least. The improvement in the above-mentioned degree of freedom leads also to improvement in the degree of freedom of the manufacture approach of antenna equipment.

[0029] Moreover, in (2) above (1), when a dielectric film is made to intervene between a radio emission component and a dielectric layer, it is effective in the degree of freedom of selection of the dielectric which formation of a radio emission component becomes easy, and constitutes a dielectric layer becoming still larger by carrying out selection use of what consisted of good ingredients of the applicability of the etching technique of a radio emission component as this dielectric film.

[0030] Moreover, in any 1 term of (5) above-mentioned (1) - (4), when another dielectric layer is arranged on a radio emission component, adjustment in the still larger range is attained in the beam width in the radiation pattern of an antenna, and the dielectric layer according to above is effective in acting as a protective layer of a radio emission component regardless of the class of dielectric which constitutes it.

[0031] Moreover, in (6) above (5), when one or more another radio emission components are arranged on another dielectric layer, there is effectiveness which can carry out [broadband]-izing of the impedance characteristic of antenna equipment.

[0032] Moreover, in (7) above (6), another dielectric layer becomes easy [adjustment of the beam width of the above-mentioned radiation pattern] at broadband-izing of said impedance characteristic of antenna equipment, and a list for specific inductive capacity and/or thickness to be uneven in the direction of thickness at least.
[0033] Furthermore, in (8) above (5), when another dielectric film is made to intervene between dielectric layers different from another radio emission component, it is effective in the degree of freedom of selection of the dielectric which formation of a radio emission component becomes easy, and constitutes a dielectric layer like the case of the above (2) becoming still larger.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention relates to the antenna equipment suitable for being used for the communication link fields, such as satellite communication and microwave communication, and constituting an array antenna.

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PRIOR ART

[Description of the Prior Art] Conventionally, as structure of this kind of antenna equipment, there are some which were carried on 109th page - 110th page of an antenna engineering handbook, for example, and drawing 12 is that outline structural drawing. As for a radio emission component and 2, in drawing 12 , 1 is [a dielectric layer and 3]

conductor layers. The conventional dielectric layer 2 is constituted by the dielectric plate which consists of a single dielectric, and the radio emission component 1 and a conductor layer 3 are formed by each giving a thin conductor to such a dielectric plate. Moreover, the laminating of a dielectric layer and the dielectric film is carried out to order on a conductor layer, and the technique which forms a radio emission component on this dielectric film is indicated by JP,9-107226,A.

[0003] In drawing 12 , if electric power is supplied to the radio emission component 1, between the edge of the radio emission component 1, and a conductor layer 3, electric field, i.e., the magnetic current, will occur and a resonator will be formed. In order that this source of the magnetic current may operate as a slot antenna, an electric wave is emitted in the perpendicular direction (the direction of the thickness of a dielectric layer 2) to this antenna equipment. In addition, the magnitude of the radio emission component 1 is decided with the specific inductive capacity and thickness of an operating frequency and a dielectric layer 2.

[0004] By the way, with conventional antenna equipment, since only the dielectric of limited **** part had been used for the configuration of a dielectric layer 2, adjustment of the beam width of the radiation pattern of antenna equipment is difficult, and a miniaturization and thin-shape-izing of antenna equipment also had the problem that it was restricted to some extent.

[0005]

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] Specific inductive capacity and/or thickness set the antenna equipment of this invention in the direction of thickness at least while it is arranged on (1) conductor layer and the above-mentioned conductor layer, as explained above. An uneven dielectric layer, It has the radio emission component arranged on the above-mentioned dielectric layer, and sets to (3) above (1) or the after-mentioned (2). And a dielectric layer The specific inductive capacity in directly under [of a radio emission component] and its near of the above-mentioned dielectric layer is uniform at least, and thickness is uneven, and it sets to (4) above (1) or the after-mentioned (2). A dielectric layer It becomes easy to adjust [of beam width / in / that it is uneven and thickness is uniform / the radiation pattern of an antenna] the specific inductive capacity in directly under [of a radio emission component] and its near of the above-mentioned dielectric layer at least. For example, if it applies to a radio emission component side from a

conductor-layer side and specific inductive capacity is made to increase gradually, beam width can be narrowed, and beam width can be made large if it is made reverse. Moreover, if specific inductive capacity is made to change at random, it can consider as desired beam width. Moreover, it is effective in degrees of freedom, such as a miniaturization of antenna equipment which moreover could not accomplish the dielectric of ********** part at all with the single and used conventional technique, thin-shape-izing, and a configuration, improving by a dielectric layer consisting of various kinds of dielectrics with which specific inductive capacity and/or thickness become uneven in the direction of thickness at least. The improvement in the above-mentioned degree of freedom leads also to improvement in the degree of freedom of the manufacture approach of antenna equipment.

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[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] In view of the above-mentioned actual condition in the conventional technique, adjustment of the beam width in the radiation pattern of an antenna is easy for this invention, and it makes it a technical problem to offer the antenna equipment whose degree of freedom of the miniaturization of antenna equipment or thin-shape-izing improved.
[0006]

[Translation done.]

MEANS

[Means for Solving the Problem] The antenna equipment of this invention is equipped with the radio emission component by which specific inductive capacity and/or thickness have been arranged at least on an uneven dielectric layer and the above-mentioned dielectric layer in the direction of thickness while it is arranged on (1) conductor layer and the above-mentioned conductor layer.
(2) Make a dielectric film intervene between a radio emission component and a dielectric layer in the above (1).
(3) In the above (1) or (2), the specific inductive capacity of a dielectric layer in directly under [of a radio emission component] and its near of the above-mentioned dielectric layer is uniform at least, and its thickness is uneven.
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(7) In the above (6), specific inductive capacity and/or thickness of another dielectric layer are uneven in the direction of thickness at least.
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[Embodiment of the Invention] In the gestalt of many following operations, with the

gestalt of implementation of the consecutiveness about the same part as the part shown in the gestalt of the operation to precede, a same sign may be attached and explanation of each contents may be omitted as referring to explanation with the gestalt of the operation to precede.

[0008] Gestalt 1. drawing 1 of operation - drawing 2 explain the gestalt 1 of operation of the antenna equipment in this invention, drawing 1 is the decomposition perspective view of the gestalt 1 of operation, and drawing 2 is the sectional view which met the II-II line in the condition of drawing 1 of not decomposing. For 1, as for a dielectric layer and 3, in drawing 1 - drawing 2 , a radio emission component and 2 are [a conductor layer and 4] dielectric films.

[0009] A dielectric layer 2 differs from the conventional antenna equipment which specific inductive capacity's is uneven and is shown in drawing 12 in this point fundamentally in the direction of that thickness. Noting that there is especially no limit about the heterogeneity of the specific inductive capacity in a dielectric layer 2, for example, a dielectric layer 2 is the multilayer structure of n layers now in this invention It applies to the radio emission component 1 side from a conductor-layer 3 side, and they are the 1st layer and layer [2nd] .... the i-th layer. Supposing it consists of layer [i+1st] .... the n-th layer A gestalt with the larger specific inductive capacity of the i+1st layer than that of the i-th layer, the gestalt A in which it will apply to the radio emission component 1 side from a conductor-layer 3 side, and specific inductive capacity will increase gradually if it puts in another way The specific inductive capacity of the i+1st layer is the gestalt C from which specific inductive capacity while being a gestalt smaller than that of the i-th layer, the gestalt B in which it applies to the radio emission component 1 side from a conductor-layer 3 side, and specific inductive capacity decreases gradually, and layer [1st] - the n-th layer completely changes at random, when it puts in another way. in addition, the magnitude of the above n which the overall thickness of a dielectric layer 2 is usually about lambda/[lambda/5 -] 500 (lambda: wavelength) extent, for example, 0.1-1mm, and can be set in that case -- at least 2 -- it is five to about 100 preferably, and it is desirable at least 0.01 and to set especially the difference of the specific inductive capacity of the i-th layer and the i+1st layer to at least 0.05.

[0010] About the average specific inductive capacity of a dielectric layer 2, although there is especially no limit, unless one to about ten are suitable for it and conductivity and its dielectric loss are excessive also about the component, there is especially no limit. When this component is illustrated, polyethylene, polypropylene, polybutene, Olefin system resin, such as the Polly 4 methyl pentene -1, polystyrene, Styrene resin, such as poly methyl styrene and polyacrylonitrile styrene, Fluororesin, such as polytetrafluoroethylene and polychlorotrifluoroethylene resin, A polyvinyl chloride, a polyvinylidene chloride, thermoplastic polyester, a thermoplastic polyamide, An ethylene-vinylacetate copolymer, an ethylene-ethyl acrylate copolymer, A polycarbonate, polyacetal, poly para-phenylene, poly para-phenylene oxide, The thermoplastics of others, such as polysulfone, phenol resin, an epoxy resin, They are ceramics, such as thermosetting resin, such as thermosetting polyester, a thermosetting polyamide, polyamidoimide, polyimide, and diallyl phthalate resin, alumimium nitride, silicon nitride, and boron nitride.

[0011] Change of the specific inductive capacity between layer [1st] - the n-th layer may

prepare two or more sheets with which that from which specific inductive capacity differs may be chosen from the above mentioned component or other ingredients, and the laminating of the sheet of two or more selected ingredients to write may be carried out by welding or non-welding, or whenever [foaming] differ about a certain specific ingredient, and may carry out the laminating of them by welding or non-welding. For example, by making polyethylene foam [whenever / foaming] to about 0 (foaming [no]) - 80% whenever [foaming] using a gas foaming agent like about 0 (foaming [no]) - 40%, or argon gas using a chemistry foaming agent like an AZOJI carvone amide, the thing of the range of 2.3 (foaming [no]) is obtained from low specific inductive capacity with the specific inductive capacity near 1, it is the thing of this specific-inductive-capacity range, and layer [1st] - the n-th layer may be formed.

[0012] A conductor layer 3 can be formed by plating copper and a conductive metal like aluminum on one side of a dielectric layer 2, or attachment by the adhesives of the foil of this conductive metal. Moreover, the radio emission component 1 may also be directly formed in other one side of a dielectric layer 2, without using the dielectric film 4. However, pattern formation of the radio emission component 1 is usually carried out from the deposit of copper and a conductive metal like aluminum by etching techniques, such as photo etching and a photolithography. In that case, by what has difficult application of an etching technique, it becomes difficult like a difficult thing or ceramics to form [of the radio emission component 1] plating of a conductive metal like the thing and olefin system resin with which one side besides the above of a dielectric layer 2 has irregularity in a front face like a foaming organic macromolecule. On the other hand, when the dielectric film 4 is adopted, there is also an advantage to which formation of the radio emission component 1 becomes easy as this dielectric film 4 at the formation list of the deposit of the above-mentioned conductive metal by carrying out selection use of the good ingredient of the applicability of the etching technique about this deposit, for example, thermoplastic polyester, a thermoplastic polyamide, the polycarbonate, etc., and the degree of freedom of selection of the component of a dielectric layer 2 becomes large. as a dielectric film 4, an about 50-micrometer thing is suitable from handling, and it is combined by the dielectric layer 2, welding, or adhesion -- having -- **** -- or exfoliation -- it is also good to carry out the laminating easily.

[0013] Based on having the heterogeneity of specific inductive capacity as the dielectric layer 2 described above, it becomes easy to adjust [of the beam width of the radiation pattern of an antenna] the antenna equipment of the gestalt 1 of operation. For example, beam width can be made large if it is the aforementioned gestalt B in which beam width can be narrowed, it applies to the radio emission component 1 side from a conductor-layer 3 side conversely, and specific inductive capacity decreases gradually by considering as the aforementioned gestalt A in which it applies to the radio emission component 1 side from a conductor-layer 3 side, and specific inductive capacity increases gradually. Moreover, when the specific inductive capacity between layer [1st] - the n-th layer considers as the gestalt C of the above which completely changes at random, it can consider as desired beam width. With the conventional technique which is single and has moreover used the dielectric of ********** part, it is effective in the degree of freedom of the miniaturization of antenna equipment or thin-shape-izing which could not be accomplished at all improving by adopting various things as a component of a dielectric layer 2 furthermore, and being whenever [various foaming] and using it if

needed.
[0014] Gestalt 2. drawing 3 of operation is the sectional view of the gestalt 2 of operation of the antenna equipment in this invention. For 1, as for a dielectric layer and 3, in drawing 3 , a radio emission component and 2 are [a conductor layer and 4] dielectric films. Although a single carries out the deer of the dielectric layer 2 and specific inductive capacity consists of one sort of a fixed dielectric which was described above, unlike the gestalt 1 of operation, the thickness of other structures is the same by the part in an uneven point. It is thin meat directly under the radio emission component 1, and the dielectric layer 2 of the other part is heavy-gage. The gaseous-phase section S exists between a dielectric layer 2 and a conductor layer 3. By carrying out thickness of a dielectric layer 2 as above-mentioned, beam width can be made large. In addition, as a deformation gestalt of the gestalt 2 of operation, with the case of the gestalt 2 of operation, it supposes that it is conversely heavy-gage directly under the radio emission component 1 of a dielectric layer 2, and if the other part is used as thin meat, it can narrow beam width.
[0015] Gestalt 3. drawing 4 of operation is the sectional view of the gestalt 3 of operation of the antenna equipment in this invention. As for a radio emission component and 2, in drawing 4 , 1 is [a dielectric layer and 3] a conductor layer and dielectric layer with 4 [another / a dielectric film and 21]. The gestalten 3 of operation differ in the point that the laminating of the dielectric layer 21 was carried out on the radio emission component 1, and are [other structures] the same. [of the gestalt 1 of said operation]
[0016] A dielectric layer 21 may be uneven identically to a dielectric layer 2 uniformly [specific inductive capacity / in / it may be constituted by different dielectric and / the direction of the thickness] like a dielectric layer 2. A dielectric layer 21 is effective in acting as a protective layer of the radio emission component 1 regardless of the class of dielectric which constitutes it. Furthermore, if it is made for specific inductive capacity to increase gradually, applying the specific inductive capacity of a dielectric layer 21 to an outside-surface side from the radio emission component 1 side like Gestalt A when the specific inductive capacity of a dielectric layer 2 is said gestalt A, a dielectric layer 21 Beam width is made still narrower, and when the specific inductive capacity of a dielectric layer 2 is said gestalt B conversely and it is made for specific inductive capacity to decrease gradually, applying the specific inductive capacity of a dielectric layer 21 to an outside-surface side from the radio emission component 1 side like Gestalt B, there is effectiveness which makes beam width large further.
[0017] Gestalt 4. drawing 5 of operation is the sectional view of the gestalt 4 of operation of the antenna equipment in this invention. As for a radio emission component and 2, in drawing 5 , 1 is [a dielectric layer and 3] a conductor layer and dielectric layer with 4 [another / a dielectric film and 22]. The gestalten 4 of operation differ in the point that the laminating of the dielectric layer 22 was carried out on the radio emission component 1, and are [other structures] the same. [of the gestalt 1 of said operation]
[0018] As for the thickness, right above [of the radio emission component 1] is thin meat, and the dielectric layer 22 of the other part is heavy-gage, although a single carries out a deer and specific inductive capacity consists of one sort of a fixed dielectric which was described above. A dielectric layer 22 can make beam width large further by being as the thickness being the above, when the specific inductive capacity of a dielectric layer 2 other than the effectiveness of acting as a protective layer of the radio emission

component 1 like the dielectric layer 21 in the gestalt 3 of operation is said gestalt B. On the other hand, when the specific inductive capacity of a dielectric layer 2 is said gestalt A, right above [of the radio emission component 1 of a dielectric layer 22] presupposes that it is heavy-gage, and the other part has the effectiveness which can make beam width still narrower by considering as thin meat.

[0019] It is VII-VII [in / gestalt 5. drawing 6 of operation - drawing 7 explain the gestalt 5 of operation of the antenna equipment in this invention, and drawing 6 is the decomposition perspective view of the gestalt 5 of operation, and / in drawing 7 / the condition of drawing 6 of not decomposing]. It is the sectional view which met the line. In drawing 6 - drawing 7 , 1 is a radio emission component and dielectric film with 2 [another / a dielectric layer, dielectric layer with 3 / another / a conductor layer, radio emission component with 4 / another / a dielectric film and 11 /, and 23 / again /, and 41].

[0020] Unlike the gestalt 1 of operation, in the point which carried out the laminating of a dielectric layer 23, the dielectric film 41, and the radio emission component 11 one by one on the radio emission component 1, the other structures of the gestalt 5 of operation are the same. In the above-mentioned structure, there is effectiveness which can carry out [broadband]-izing of the impedance characteristic of antenna equipment by supplying electric power to the radio emission component 1 by using the radio emission component 11 as a passive element.

[0021] In the gestalt 5 of operation, a deer is carried out, it is formed by the etching technique about the conductive metal layer plated on the dielectric film 41, the radio emission component 11 of the function of the dielectric film 41 is the same as that of the function of the dielectric film 4 to said radio emission component 1, and when formation of a up to [the dielectric layer 23 of the radio emission component 11] is easy, it can also omit the dielectric film 41.

[0022] A dielectric layer 23 may be uneven identically to a dielectric layer 2 uniformly [specific inductive capacity / in / it may be constituted by different dielectric and / the direction of the thickness] like a dielectric layer 2. Furthermore, if it is made for specific inductive capacity to increase gradually, applying the specific inductive capacity of a dielectric layer 23 to the radio emission component 11 side from the radio emission component 1 side like Gestalt A when the specific inductive capacity of a dielectric layer 2 is said gestalt A, a dielectric layer 23 Beam width is made still narrower, and when the specific inductive capacity of a dielectric layer 2 is said gestalt B conversely and it is made for specific inductive capacity to decrease gradually, applying the specific inductive capacity of a dielectric layer 23 to the radio emission component 11 side from the radio emission component 1 side like Gestalt B, there is effectiveness which makes beam width large further.

[0023] Gestalt 6. drawing 8 of operation - drawing 9 explain the gestalt 6 of operation of the antenna equipment in this invention, drawing 8 is the decomposition perspective view of the gestalt 6 of operation, and drawing 9 is the sectional view which met the IX-IX line in the condition of drawing 8 of not decomposing. In drawing 8 - drawing 9 , 24 is still more nearly another dielectric layer, and the gestalten 6 of operation differ in the point that the laminating of the dielectric layer 24 was carried out on the radio emission component 11, and are [other structures] the same. [of the gestalt 5 of said operation]

[0024] A dielectric layer 24 may be uneven identically to a dielectric layer 2 uniformly [

specific inductive capacity / in / it may be constituted by different dielectric and / the direction of the thickness] like a dielectric layer 2. Since the radio emission component 11 and the dielectric film 41 will be inserted into a dielectric layer 24 and a dielectric layer 23 and the location gap to the radio emission component 1 of bending of the dielectric film 41 and the radio emission component 11 is prevented by preparing it regardless of the class of dielectric which constitutes a dielectric layer 24, manufacture of antenna equipment becomes easy. A dielectric layer 24 is furthermore effective in acting also as a protective layer of the radio emission component 1. Furthermore, a dielectric layer 24 is effective in making beam width still more widely or narrow in harmony with change of the specific inductive capacity of a dielectric layer 2 or a dielectric layer 23, and enabling still minuter accommodation of beam width, and raising the degree of freedom of the miniaturization of antenna equipment, or thin-shape-izing by changing the specific inductive capacity in the thickness direction gradually.

[0025] Gestalt 7. drawing 10 of operation - drawing 11 explain the gestalt 7 of operation of the antenna equipment in this invention, drawing 10 is the decomposition perspective view of the gestalt 7 of operation, and drawing 11 is the sectional view which met the XI-XI line in the condition of drawing 10 of not decomposing. Unlike the gestalt 6 of operation, in the point of having omitted the dielectric film 41 prepared in the gestalt 6 of operation, the other structures of the gestalt 7 of operation are the same. On the occasion of manufacture of the gestalt 7 of operation, the radio emission component 11 is formed in one side of a dielectric layer 24 of a photolithography etc., subsequently, a dielectric layer 24 makes the side in which the radio emission component 11 was formed counter a dielectric layer 23, and a laminating is carried out.

[0026] The gestalt 7 of operation is effective in the dielectric film 41 which was advantageous when it consisted of dielectrics with which a dielectric layer 24 can form the radio emission component 11 in the one side by a photolithography etc., and was prepared in the gestalt 6 of operation being omissible.

[0027] This invention is not limited to the above mentioned gestalt of operation, and includes various deformation gestalten. For example, as for each dielectric layer 24 of each dielectric layer 23 of each dielectric layer 2 of the gestalten 1-7 of operation, the dielectric layer 21 of the gestalt 3 of operation, the dielectric layer 22 of the gestalt 4 of operation, the gestalt 5 of operation, and the gestalt 6 of operation, the gestalt 6 of operation, and the gestalt 7 of operation, both specific inductive capacity and thickness may be made an ununiformity by each by the approach of arbitration. Moreover, with the gestalt 7 of the gestalt 5 of operation - operation, the laminating of specific inductive capacity and/or the thickness may be carried out through an uneven dielectric layer uniformly [both specific inductive capacity and thickness] in further one or more radio emission components on the radio emission component 11.

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3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The decomposition perspective view of the gestalt 1 of operation of the antenna equipment in this invention.
[Drawing 2] The sectional view which met the II-II line of drawing 1 .
[Drawing 3] The sectional view of the gestalt 2 of operation of the antenna equipment in this invention.
[Drawing 4] The sectional view of the gestalt 3 of operation of the antenna equipment in this invention.
[Drawing 5] The sectional view of the gestalt 4 of operation of the antenna equipment in this invention.
[Drawing 6] The decomposition perspective view of the gestalt 5 of operation of the antenna equipment in this invention.
[Drawing 7] VII-VII of drawing 6 Sectional view which met the line.
[Drawing 8] The decomposition perspective view of the gestalt 6 of operation of the antenna equipment in this invention.
[Drawing 9] The sectional view which met the IX-IX line of drawing 8 .
[Drawing 10] The decomposition perspective view of the gestalt 7 of operation of the antenna equipment in this invention.
[Drawing 11] The sectional view which met the XI-XI line of drawing 10 .
[Drawing 12] The sectional view of conventional antenna equipment.
[Description of Notations]
1 A radio emission component, 11 A radio emission component, 2 A dielectric layer, 21 A dielectric layer, 22 A dielectric layer, 23 A dielectric layer, 24 A dielectric layer, 3 A conductor layer, 4 A dielectric film, 41 Dielectric film.

[Translation done.]

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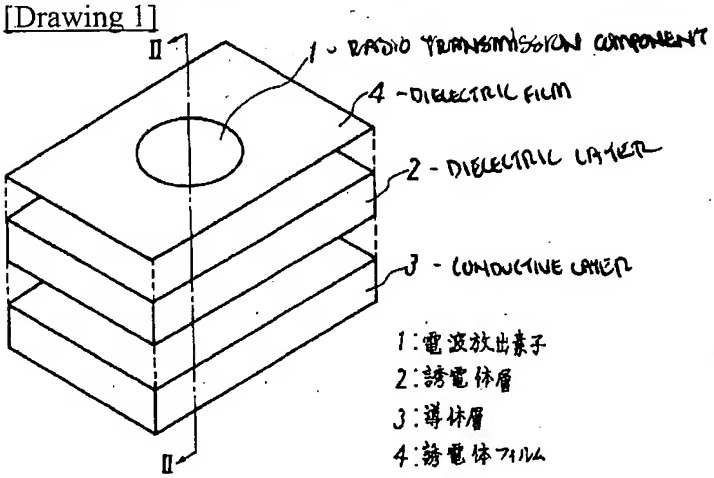
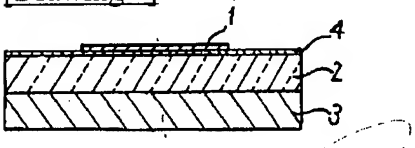
3.In the drawings, any words are not translated.

DRAWINGS

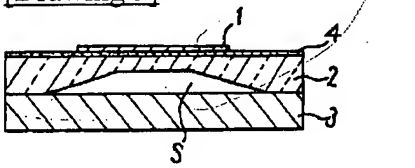
[Drawing 1]



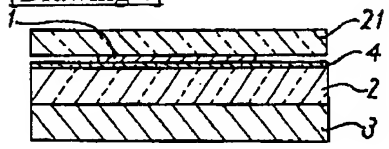
[Drawing 2]



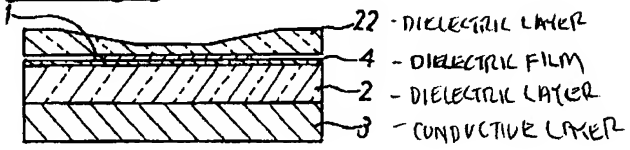
[Drawing 3]



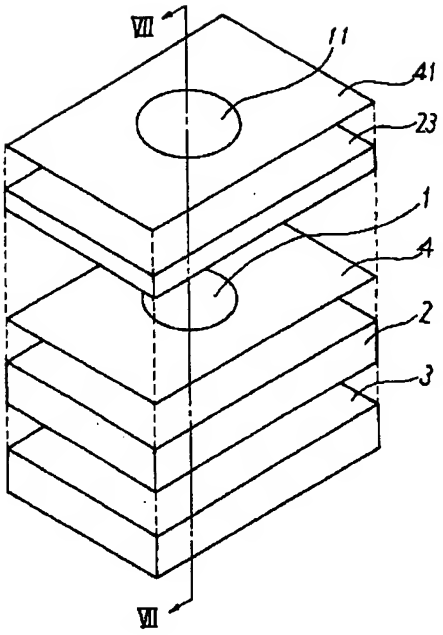
[Drawing 4]



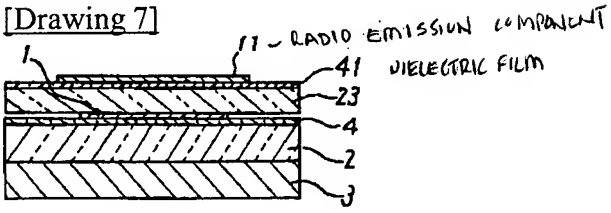
[Drawing 5]



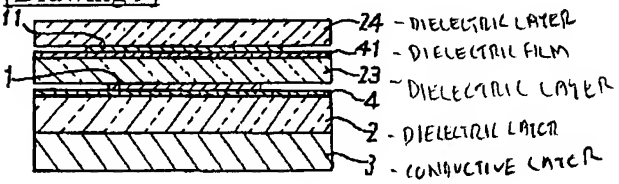
[Drawing 6]



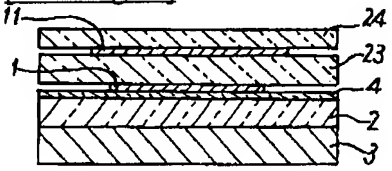
[Drawing 7]



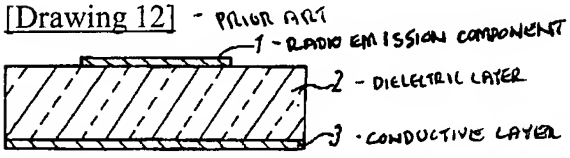
[Drawing 9]



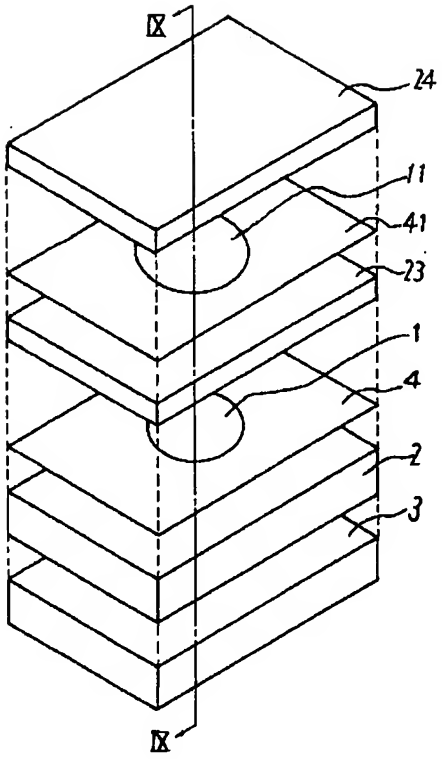
[Drawing 11]



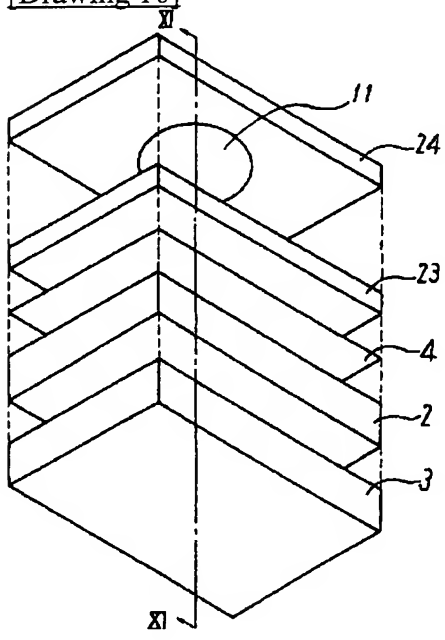
[Drawing 12] - PRIOR ART



[Drawing 8]



[Drawing 10]



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